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Applicant's Name: Youqi Wang, et al.

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Application Title: SAMPLING PROBE

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PATENTLISTING OF THE CLAIMS:

Claims 1-11 (Cancelled)

12. (Previously presented) A sampling probe for delivering a reactant to a substance deposited on a substrate to form a reaction product and for transporting the reaction product to a product analyzer for analysis, the probe comprising an inner body and an outer body having an inner cavity sized and shaped for receiving the inner body, the inner body including an upper portion fixed relative to the outer body, a tip for engaging the substrate, and a resiliently compliant element connecting the tip to the inner body and permitting the tip to move relative to the inner body, the tip having a recess sized and shaped for receiving at least a portion of the reaction product, a reactant delivery passage extending through the probe to an outlet at the tip for delivering reactant to the substance on the substrate to form the reaction product, and a reaction product sampling passage extending from the recess adapted for connection to the product analyzer for transporting at least the portion of the reaction product to the product analyzer.

13. (Cancelled)

14. (Previously presented) A probe as set forth in claim 12 wherein the resiliently compliant element comprises a bellows.

15. (Original) A probe as set forth in claim 12 wherein the reactant delivery passage has an annular section defined by an exterior surface of the inner body and an interior surface of the outer body.

16. (Previously presented) A probe as set forth in claim 12 further comprising a vent passage extending through the outer body from a vent passage inlet positioned outside the recess of the tip for removing reactant from an area outside the recess.

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17. (Original) A probe as set forth in claim 12 in combination with a scanning mass spectrometer, said product analyzer comprising the spectrometer.

18. (Withdrawn) A method for sampling reaction products, said method comprising the steps of:

delivering a reactant through the sampling probe set forth in claim 12 to contact a substance deposited on a substrate;  
reacting the reactant to form a reaction product;  
withdrawing at least a portion of the reaction product through the sampling probe; and  
analyzing the withdrawn portion of the reaction product.

Claims 19-23 (Cancelled)

24. (Previously presented) A sampling probe for delivering a reactant to a substance deposited on a substrate to form a reaction product and for transporting the reaction product to a product analyzer for analysis, the probe comprising a body, a tip positionable over the substance on the substrate, a resiliently compliant element connecting the tip to the body and permitting the tip to move relative to the body, a recess in the tip sized and shaped for receiving at least a portion of the reaction product, a reaction product sampling passage extending from the recess adapted for connection to the product analyzer for transporting at least a portion of the reaction product to the product analyzer, and a reactant delivery passage extending to an outlet positioned at the tip for delivering reactant to the substance on the substrate to form the reaction product.

25. (Original) A probe as set forth in claim 24 wherein the resiliently compliant element comprises a bellows.

26. (Previously presented) A probe as set forth in claim 24 further comprising a vent passage extending from a vent passage inlet positioned on the body for removing reactant.

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27. (Original) A probe as set forth in claim 26 wherein the vent passage inlet is positioned at the tip for removing reactant from an area outside the recess.

28. (Previously presented) A probe as set forth in claim 24 further comprising an overflow vent passage positioned in the body to remove excess reactant before said excess reactant reaches said outlet.

29. (Original) A probe as set forth in claim 24 in combination with a scanning mass spectrometer, said product analyzer comprising the spectrometer.

30. (Withdrawn) A method for sampling reaction products, said method comprising the steps of:  
delivering a reactant through the sampling probe set forth in claim 24 to contact a substance deposited on a substrate;  
reacting the reactant to form a reaction product;  
withdrawing at least a portion of the reaction product through the sampling probe; and  
analyzing the withdrawn portion of the reaction product.

31. (Previously presented) A sampling probe for delivering a reactant to a substance deposited on a substrate to form a reaction product and for transporting the reaction product to a product analyzer for analysis, the probe comprising a body, a tip connected to the body and adapted to contact the substrate, a recess in the tip sized and shaped for receiving at least a portion of the reaction product, a reaction product sampling passage extending from the recess adapted for connection to the product analyzer for transporting at least a portion of the reaction product to the product analyzer, and a reactant delivery passage extending to an outlet positioned at an exterior of the tip for delivering reactant to the substance on the substrate to form the reaction product, wherein the tip includes at least one opening separate from the sampling passage permitting reactants

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to flow from the exterior of the tip into the recess when the tip contacts the substrate.

32. (Original) A probe as set forth in claim 31 further comprising a resiliently compliant element connecting the tip to the body for permitting the tip to move relative to the body.

33. (Original) A probe as set forth in claim 32 wherein the resiliently compliant element comprises a bellows.

34. (Previously presented) A probe as set forth in claim 31 further comprising a vent passage extending from a vent passage inlet positioned on the body adjacent the tip for removing reactant.

35. (Previously presented) A probe as set forth in claim 31 further comprising an overflow vent passage positioned in the body to remove excess reactant before said excess reactant reaches said outlet.

36. (Original) A probe as set forth in claim 31 in combination with a scanning mass spectrometer, said product analyzer comprising the spectrometer.

37. (Withdrawn) A method for sampling reaction products, said method comprising the steps of:  
delivering a reactant through the sampling probe set forth in claim 31 to contact a substance deposited on a substrate;  
reacting the reactant to form a reaction product;  
withdrawing at least a portion of the reaction product through the sampling probe; and  
analyzing the withdrawn portion of the reaction product.

38. (Previously presented) A sampling probe for delivering a reactant to a substance deposited on a substrate to form a reaction product and for transporting the reaction product to a

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product analyzer for analysis, the probe comprising a body, a tip connected to the body and engageable with the substrate, a recess in the tip sized and shaped for receiving at least a portion of the reaction product, a product sampling passage extending from the recess adapted for connection to the product analyzer for transporting at least a portion of the reaction product to the product analyzer, a reactant delivery passage extending to an outlet positioned at the tip for delivering reactant to the substance on the substrate to form the reaction product, and an overflow vent passage positioned in the body to remove excess reactant before said excess reactant reaches said outlet for optimizing contact time between the reactant and the substance.

39. (Original) A probe as set forth in claim 38 further comprising a resiliently compliant element connecting the tip to the body for permitting the tip to move relative to the body.

40. (Original) A probe as set forth in claim 39 wherein the resiliently compliant element comprises a bellows.

41. (Original) A probe as set forth in claim 38 in combination with a scanning mass spectrometer, said product analyzer comprising the spectrometer.

42. (Withdrawn) A method for sampling reaction products, said method comprising the steps of:  
delivering a reactant through the sampling probe set forth in claim 38 to contact a substance deposited on a substrate;  
reacting the reactant to form a reaction product;  
withdrawing at least a portion of the reaction product through the sampling probe; and  
analyzing the withdrawn portion of the reaction product.

43. (Withdrawn) A method for sampling reaction products, said method comprising the steps of:

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delivering a reactant through a sampling probe to contact a substance deposited on a substrate;

reacting the reactant to form a reaction product;

withdrawing at least a portion of the reaction product through the sampling probe;

contacting the sampling probe with the substrate during at least a portion of the delivering, reacting and withdrawing steps; and

analyzing the withdrawn portion of the reaction product.

44. (Withdrawn) A method as set forth in claim 43 wherein the probe is contacted with the substrate for less than about 2 minutes during the delivering, reacting and withdrawing steps.

45. (Withdrawn) A method as set forth in claim 44 wherein said substance is a first substance of a plurality of substances deposited in an array on the substrate, and the steps of delivering, reacting, withdrawing, contacting and analyzing are performed sequentially for each of the substances deposited on the substrate.

46. (Withdrawn) A method as set forth in claim 43 wherein the reactant has a contact time with the substance of greater than 1 second.

47. (Withdrawn) A method as set forth in claim 46 wherein the reactant has a contact time with the substance of between about 2 seconds and about 10 seconds.

48. (Withdrawn) A method for sampling reaction products, said method comprising the steps of:

delivering a reactant through a sampling probe to contact a substance deposited on a substrate;

reacting the reactant to form a reaction product, the reactant having a contact time with the substance of greater than 1 second;

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withdrawing at least a portion of the reaction product through the sampling probe; and  
analyzing the withdrawn portion of the reaction product.

49. (Withdrawn) A method as set forth in claim 48 wherein the reactant has a contact time with the substance of between about 2 seconds and about 10 seconds.

50. (Previously presented) A probe as set forth in claim 31 wherein said at least one opening is a groove formed in the tip.

51. (Previously presented) A sampling probe for delivering reactants to a substance deposited on a substrate to form a reaction product and for transporting the reaction product to a product analyzer for analysis, the probe comprising a tip positionable over the substance on the substrate, an outer body having an inner cavity, an inner body positioned in the inner cavity, a mixing chamber inside the probe above an upper end face of the inner body for mixing reactants therein, a plurality of reactant source passages extending through the probe from a plurality of reactant sources to the mixing chamber for delivering reactants to the mixing chamber, a reactant delivery passage extending from the mixing chamber to an outlet positioned at the tip for delivering reactants from the mixing chamber to the substance on the substrate thereby forming the reaction product, a lower recess in the tip sized and shaped for receiving at least a portion of the reaction product, and a reaction product sampling passage extending from the lower recess adapted for connection to the product analyzer for transporting at least the portion of the reaction product to the product analyzer.

52. (Cancelled)

53. (Previously presented) A probe as set forth in claim 51 wherein the reactant delivery passage extends through said inner body.



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54. (Previously presented) A probe as set forth in claim 53 further comprising a cover mounted on the body covering the inner body and forming an upper recess between the cover and a lower end face of the inner body, and an aperture extending through the cover to permit reactants to pass through the cover to the substance, wherein said aperture is offset from the reactant delivery passage in the inner body to promote mixing of the reactants in the upper recess.

55. (Previously presented) A probe as set forth in claim 54 further comprising a vent passage extending from an annular recess positioned outside the lower recess of the tip for removing reactant from an area outside the lower recess.

56. (Previously presented) A probe as set forth in claim 55 further comprising a barrier surrounding the tip and disposed outside the annular recess, the barrier inhibiting contamination of adjacent substances on the substrate.

57. (Previously presented) A sampling probe for delivering reactants to a substance deposited on a substrate to form a reaction product and for transporting the reaction product to a product analyzer for analysis, the probe comprising a tip positionable over the substance on the substrate, a mixing chamber positioned inside the probe for mixing reactant therein, at least one reactant source passage extending through the probe from at least one reactant source to the mixing chamber for delivering reactant to the mixing chamber, a reactant delivery passage extending from the mixing chamber to an outlet positioned at the tip for delivering reactant from the mixing chamber to the substance on the substrate thereby forming the reaction product, a recess in the tip sized and shaped for receiving at least a portion of the reaction product, a reaction product sampling passage extending from the recess adapted for connection to the product analyzer for transporting at least the portion of the reaction product to the product analyzer, and an overflow vent

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passage in fluid communication with the mixing chamber and positioned in the probe for removing excess reactant from the mixing chamber before said excess reactant reaches said outlet.

58. (Previously presented) A probe as set forth in claim 57 further comprising a heater inside the probe for heating the reactant.

59. (Previously presented) A probe as set forth in claim 12 further comprising a heater inside the probe for heating the reactant.

60. (Previously presented) A probe as set forth in claim 24 further comprising a heater inside the probe for heating the reactant.

61. (Previously presented) A probe as set forth in claim 31 further comprising a heater inside the probe for heating the reactant.

62. (Previously presented) A probe as set forth in claim 38 further comprising a heater inside the probe for heating the reactant.

63. (Previously presented) A probe as set forth in claim 51 further comprising a heater inside the probe for heating the reactant.

64. (New) A sampling probe for delivering a reactant to a substance deposited on a substrate to form a reaction product and for transporting the reaction product to a product analyzer for analysis, the probe comprising an inner body and an outer body having an inner cavity sized and shaped for receiving the inner body, the inner body including an upper portion fixed relative to the outer body, a tip having a recess sized and shaped for receiving at least a portion of the reaction product, a reactant

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delivery passage extending through the probe to an outlet at the tip for delivering reactant to the substance on the substrate to form the reaction product, the reactant delivery passage having an annular section defined by an exterior surface of the inner body and an interior surface of the outer body, and a reaction product sampling passage extending from the recess adapted for connection to the product analyzer for transporting at least the portion of the reaction product to the product analyzer.

65. (New) A probe as set forth in claim 64 further comprising a vent passage extending through the outer body from a vent passage inlet positioned outside the recess of the tip for removing reactant from an area outside the recess.

66. (New) A probe as set forth in claim 64 in combination with a substrate having a substance thereon, the tip being engageable with substrate and positionable over the substance on the substrate.

67. (New) A sampling probe for delivering a reactant to a substance deposited on a substrate to form a reaction product and for transporting the reaction product to a product analyzer for analysis, the probe comprising a body, a tip positionable over the substance on the substrate, a bellows connecting the tip to the body, a recess in the tip for receiving at least a portion of the reaction product, a reaction product sampling passage extending from the recess for connection to the product analyzer for transporting at least a portion of the reaction product to the product analyzer, and a reactant delivery passage extending to an outlet positioned at the tip for delivering reactant to the substance on the substrate.

68. (New) A sampling probe for delivering a reactant to a substance deposited on a substrate to form a reaction product and for transporting the reaction product to a product analyzer for analysis, the probe comprising a body, a tip, a resiliently

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compliant element connecting the tip to the body, a recess in the tip sized and shaped for receiving at least a portion of the reaction product, a product sampling passage extending from the recess adapted for connection to the product analyzer for transporting at least a portion of the reaction product to the product analyzer, a reactant delivery passage extending to an outlet positioned at the tip for delivering reactant to the substance on the substrate to form the reaction product, and an overflow vent passage positioned in fluid communication with the recess.